BUILDING 707/707A DECOMMISSIONING BASIS FOR INTERIM OPERATION (DBIO)

CHAPTER 7

DERIVATION OF TECHNICAL SAFETY REQUIREMENTS (TSRs)

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None.

7. DERIVATION OF TECHNICAL SAFETY REQUIREMENTS

This chapter summarizes the controls that were credited, specified as defense-in-depth, or otherwise determined appropriate by the accident analyses presented in Chapter 6 of this DBIO. Controls that need to be carried forward to become Technical Safety Requirements (TSRs) are described in this chapter and are either Engineered Safety Features (ESFs) or are administrative in nature. The ESFs are generally controlled through Limiting Conditions for Operations (LCOs), while administrative elements are specified through ACs.

The accident analyses presented in Chapter 6 of this DBIO identify those controls available to either prevent the occurrence of an accident or to mitigate the consequence of the accident to the Worker and the Public. The safety classification of a given control is established in this chapter. Safety classification is specifically applied to those ESFs relied upon to achieve a Risk *CLASS III* for either the Public or the Worker.

Safety classifications subject to TSR level control fall into two categories: 1) Safety Class, those controls required to reduce the consequence to the Public to below 5 rem; and 2) Safety Significant, those controls required to lower the risk classification to either the Public or the Worker to Risk *CLASS III* and specified defense-in-depth controls. The analyses presented in Chapter 6 of this DBIO indicate that no controls require Safety Class designation. Therefore, the ESFs credited in the analyses are designated Safety Significant.

7.1 ENGINEERED SAFETY FEATURES IDENTIFIED BY THE ACCIDENT ANALYSIS

The following sections identify and discuss the need for ESFs required by the accident analysis to reduce the consequence to the Public and/or the Worker to Risk *CLASS III*. The requirements for these ESFs are specified in the LCO portion of the TSRs.

7.1.1 Confinement (LPF = 0.1)

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An operable ventilation system, to maintain a negative Building pressure, with at least one intact stage of tested HEPA filtration obtains a consequence reduction by three orders of magnitude. For this DBIO, only one order of magnitude in consequence reduction is required to obtain Risk Class III for a given receptor. However, aerosol testing of the HEPA filters will be continued within the LCO. Additionally, an intact building structure with an inoperable ventilation system (i.e., static LPF) may be credited with one order of magnitude reduction in consequences. A building with a small direct leakpath to the environment (e.g., an open door) having operational ventilation system with filtration could also be credited with one order of magnitude reduction in consequences.

To reduce the consequence to the Worker from an accident that occurs inside the building, credit for a LPF of 0.1 is taken for seven of the accident scenarios evaluated. For all of the scenarios, a LPF of 0.1 was identified as a Defense-In-Depth control for the Public. The scenarios for which crediting a LPF of 0.1 to reduce consequences below Risk *Class III*, or identified as a Defense-In-Depth Control, are listed in Table 7-1.

TABLE 7-1. SCENARIOS THAT REQUIRE CONFINEMENT (LPF = 0.1)

Scenario	Requirement
SMALL FIRE – SMALL FIRE IN A GLOVEBOX (707-2-2)	Credited – Worker
SMALL FIRE – SMALL FIRE - CONTAINER (707-D&D-1)	Credited – Worker
SMALL FIRE – SMALL FIRE IN BUILDING, 10-GALLON DRUMS INCLUDED (707-D&D-1a)	Credited – Worker
MEDIUM FIRE – MEDIUM CONTAINER FIRE (707-D&D-3)	Credited – Worker
MEDIUM FIRE – MEDIUM POOL FIRE (707-D&D-3b)	Credited – Worker
MEDIUM FIRE – MEDIUM FIRE AIRLOCK (707-D&D-16)	Credited – Worker
LARGE FIRE – LARGE FIRE - CONTAINERS (707-D&D-5)	Credited – Worker
LARGE FIRE – LARGE MODULE FIRE (707-D&D-6)	Credited – Worker
LARGE FIRE – LARGE FIRE AIRLOCK (707-D&D-17)	Credited – Worker
LARGE FIRE – LARGE POOL FIRE (707-D&D-5a)	Credited – Worker
MAJOR FIRE – BUILDING (707-D&D-7)	Credited – Worker Defense in Depth – Public
MAJOR FIRE – MAJOR POOL FIRE (707-D&D-7a)	Credited – Worker Defense in Depth – Public
SPILL – CONTAINER SPILL INSIDE BUILDING (707-6-13)	Credited – Worker
SPILL – CONTAINER IMPACT INSIDE BUILDING (707-6-32)	Credited – Worker
EXPLOSION – HYDROGEN DEFLAGRATION/DRUM (707-2-7)	Credited – Worker
EXPLOSION – MODULE VAPOR-CLOUD (707-D&D-9)	Credited – Worker

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In areas inside 707/707A that meet the scenario descriptions that credit building/area confinement with a LPF of 0.1 as a mitigative control to reduce the consequences, the LPF will be maintained as a Safety Significant system. This requirement is only needed until an area is operationally clean and maintained in accordance with the Operationally Clean AC discussed below. If a portion of the building is to be relieved of the requirement for confinement, it should be separated from areas of the building that still require confinement by a fire barrier sufficient to prevent a fire from breaching the confinement of the area that still requires it.

7.1.2 Area Fire Suppression

Six scenarios credit area fire suppression with a reduction in frequency to achieve Risk *Class III.* The scenarios that credit area fire suppression are listed in Table 7-2 below.

TABLE 7-2. SCENARIOS THAT REQUIRE AREA FIRE SUPPRESSION

Scenario	Requirement
MEDIUM FIRE – CONTAINER (707-D&D-3)	Defense-in-Depth – Worker
MEDIUM FIRE – MEDIUM POOL FIRE (707-D&D-3B)	Defense-in-Depth – Worker
MEDIUM FIRE – AIRLOCK (707-D&D-16)	Defense-in-Depth – Worker
LARGE FIRE – CONTAINERS (707-D&D-5)	Credited – Worker
LARGE FIRE – LARGE POOL FIRE (707-D&D-5A)	Credited – Worker
LARGE FIRE – MODULE (707-D&D-6)	Credited – Worker
LARGE FIRE – LARGE FIRE AIRLOCK (707-D&D-17)	Credited – Worker
MAJOR FIRE – BUILDING (707-D&D-7)	Credited – Public and Worker
MAJOR FIRE – MAJOR POOL FIRE (707-D&D-7a)	Credited – Public and Worker

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Small fires are not expected to activate the area fire suppression system. Activation of area fire suppression by a medium fire is expected to reduce the likelihood that the fire will grow into a large or major fire. As such, credit is taken for the fire suppression system as a preventive control to reduce the likelihood of a large or major fire; therefore the area fire suppression system is considered Safety Significant. Since fire suppression is credited as a preventive control to reduce the likelihood of a large or major fire, the fire suppression system is designated as a Defense-In-Depth control for Medium Fires requiring crediting preventive/mitigative controls.

7.1.3 Plenum Deluge System

The heat generated from the fires analyzed is not expected to challenge the integrity of the exhaust HEPA filters as specified in *Building 707 Complex Fire Hazards Analysis* (Ref. 7-1) however, the plenum deluge system is included as a Safety Significant defense-in-depth control. There are six scenarios for which the plenum deluge system is included as a defense-in-depth control as listed in Table 7-3 below.

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TABLE 7-3. SCENARIOS THAT REQUIRE PLENUM DELUGE SYSTEM

Scenario	Requirement
LARGE FIRE – CONTAINERS (707-D&D-5)	Defense in Depth –Worker
LARGE FIRE – LARGE POOL FIRE (707-D&D-5A)	Defense in Depth –Worker
LARGE FIRE – MODULE (707-D&D-6)	Defense in Depth –Worker
LARGE FIRE – LARGE FIRE AIRLOCK (707-D&D-17)	Defense in Depth – Worker
MAJOR FIRE – BUILDING (707-D&D-7)	Defense in Depth – Public and Worker
MAJOR FIRE – MAJOR POOL FIRE (707-D&D-7a)	Defense in Depth – Public and Worker

The purpose of the plenum deluge system is to prevent heat or embers due to a fire from damaging or breaching the exhaust HEPA filters. Therefore, the requirement for a plenum deluge system exists for a given Zone I or Zone II exhaust filter plenum until the areas exhausted by that exhaust filter plenum are operationally clean or the plenum is removed from service.

7.1.4 Criticality Accident Alarm System (CAAS)

Due to the potential for a criticality, the CAAS is required to protect Workers. The analysis for this scenario, in Chapter 6, indicates that an unmitigated criticality is Risk *CLASS I* for the Worker without prevention or mitigation. Therefore, in addition to crediting the Criticality Safety Program for providing double contingency in the development of criticality controls as a preventive measure, the CAAS is maintained as a Safety Significant system that protects the Worker.

This system detects criticalities and emits an alarm signal to warn Workers to leave the area immediately. The immediate evacuation of Workers allows them to receive less radiation dose than if they are not warned and remain in the area of the criticality. The Worker is also protected from entering the criticality 12-Rad Boundary by annunciation of the criticality alarm over the Life Safety and Disaster Warning System and/or warning strobes or beacons.

7.2 ADMINISTRATIVE CONTROLS IDENTIFIED BY THE ACCIDENT ANALYSES

The following sections identify and define the controls, other than ESFs, required by the accident analyses. The requirements for these controls are specified in the ACs portion of the TSRs.

7.2.1 Minimum Staffing

Minimum staffing requirements are specified for Stationary Operating Engineers (SOEs) and Configuration Control Authorities (CCAs). The minimum staffing requirements for SOEs involves having at least one (1) SOE On Duty at all times (24 hours per day) and one additional SOE, dedicated to the 707/707A COMPLEX, on site and Available.
For CCAs, at least one qualified CCA shall be On Duty when workers are actively performing Hazardous Material Handling, Radioactive Waste Generation and Handling, and Decommissioning Activities (see Chapter 4). When work does not involve these activities, a CCA shall be Available to provide Facility Control decisions on emergent issues.

7.2.2 Material Control

Although material controls are not explicitly identified in the accident analyses, they are implicitly derived from the scenario assumptions. Many accident scenarios analyzed in the Preliminary Hazards Analysis result in an unmitigated Risk *CLASS III* to the receptor, therefore they do not require additional consideration in Chapter 6. However, a key assumption in several of these scenarios was the quantity of MAR involved in the accident. To protect these assumptions, the following material controls are warranted:

- Containerized radioactive waste or contaminated process equipment shall not be staged/stored in Building 778. Radioactive Waste generated during Building 778 D&D may remain in Building 778 while in-process.

  Sealed sources; contaminated laundry, personnel protective equipment, and tools; holdup in S-8 chainveyor and contaminated waste generated during Building 778 modifications; are not subject to this control.

- Up to one shipment of waste containers may be staged in a shipment staging area located outside the facility during the shift in which transportation is planned. If the containers are not being loaded onto a truck at the end of the shift, then they must be moved inside Building 707/707A periphery confinement.
- 10-Gallon drums containing $\geq$ 200g Pu equivalent shall be handled one at a time (i.e., moved independently). R4-02
- Containerized TRU waste (i.e., drums, crates, standard waste boxes) shall not be stacked.

7.2.3 Combustible Controls

Combustible controls limit the type and quantity of combustibles that may be present and ensure separation of fuel packages. These controls limit the frequency of fires of all sizes by: 1) reducing the probability that an ignition source will initiate a fire; 2) limiting the amount of combustible material available to burn in a fire; 3) limiting the ability of a fire to propagate from one fuel package to another; and 4) limiting the ability of a fire to involve nuclear materials.

7.2.4 Hot Work Controls

Hot work control is identified as an integral part of the Combustible Control Program credited for the fire scenarios presented in Chapter 6. Hot work provides a potential ignition source for fires. Control of the conduct of hot work will minimize the probability that hot work will ignite a fire.

7.2.5 Flammable/Explosive Gas Controls

Flammable/Explosive gas control was determined to be required to protect against a vapor cloud explosion. The flammable/explosive gas control limits the type and volume of gasses to be stored in areas vulnerable to vapor cloud explosions. Room volume is the primary consideration for determining the affects of a vapor cloud explosion. Room volumes allowing overpressures in excess of one pound per square inch (1 psi) results in damage to confinements and building structures depending upon the flammable/explosive gas in use.

Since an explosion involving as little as one pound of propane can cause an overpressure greater than 1 psi, propane and other gasses used in the facility would be allowed only via the USQD process.

Due to volume of K module, it is vulnerable to vapor cloud explosions. A volume limitation of 48 cubic feet at Standard Temperature and Pressure (STP) is established for the use/storage of acetylene in Module K to prevent overpressures from exceeding 1 psi. No TSR level control is required for the lecture bottles (≤ 2 cubic feet at STP).

7.2.6 Safety Management Program

The establishment, implementation, and maintenance of Safety Management Programs are inherently credited in all safety analyses. This AC ensures that Facility Management will correct SMP non-compliances in accordance with the specific SMP requirements. Additionally, this AC ensures that non-compliance tracking and trending data will be reported to the respective Site Program Owner in accordance with the specific SMP requirements.

7.2.7 Operationally Clean

This AC specifies the notification requirements for determining, declaring, and maintaining areas to be designated as Operationally Clean, as defined in the Technical Safety Requirements definitions.

7.2.8 Configuration Management

This AC provides a commitment to tracking and managing configuration changes as equipment, systems, and structures are shutdown, dismantled and removed from the facility. Specifically, this AC commits to maintaining:

1) Operations Documentation;
2) Surveillance Procedures; and
3) Non-LCO Equipment Maintenance and notification to DOE prior to removal of certain SSCs.

7.2.9 Inadequate CAAS Annunciation

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This AC directs the facility to comply with the Nuclear Criticality Safety Manual compensatory measures to permit access to areas with inadequate CAAS annunciation.

7.3 Design Features

The following identifies those ESFs required by the accident analyses. The requirements for these controls are specified in the Design Features portion of the TSRs.

- Periphery Confinement – Periphery confinement is the ultimate facility barrier credited to mitigate the consequences of fires, explosions and spills within the facility. Periphery confinement will be maintained until an area is declared Operationally Clean.
- Waste Container Integrity – Waste containers are designed, procured, and inspected to meet the respective confinement requirements.
- Drum Vents – Drum vents are designed to provide adequate venting without compromising the Department of Transportation packaging designation (i.e., Type A) of the overall container (drum). The vent allows for exhausting any gasses (e.g., hydrogen) generated during the radiolytic decomposition of hydrogenous materials, associated with the alpha/gamma decay of radiological constituents, in the packaged waste.

7.4 REFERENCES

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7-1. *Building 707 Complex Fire Hazards Analysis*, FHA-707-002, Revision 5, Draft, Rocky Flats Environmental Technology Site (RFETS), Golden, CO, June 2002.